Water

CHELSEA BEESON

Outline

Theme
Because all living things needs water, many interesting animals and plants can be found near and in streams.

Utah State Science Core Curriculum
Topic: Water
Standard [3010-02]
Students will:
• Describe the characteristics and uses of water.
• Demonstrate the effects of water on plants, animals, and people.

Suggested Field Trip Locations
A perennial stream safe for wading, such as Mill Creek or Negro Bill Canyon near Moab, or Courthouse Wash in Arches National Park. Early fall or late spring is best for wading.

Background

Among the natural communities of plants and animals existing in the high desert ecosystem, none is as lush or rich in animal life as the riparian community. Riparian zones are the lush belts of vegetation found along rivers, streams, ponds and natural lakes. (Many reservoirs lack riparian zones due to large yearly changes in shorelines.) The plants in riparian zones are not adapted to the low-water conditions existing in the surrounding desert.

DAMIAN FAGAN

Great blue herons and mallard ducks are common sights at the Matheson Wetlands Preserve in Moab.

A few of the common shrubs and trees that grow in the lower elevation riparian zones of southeastern Utah are Fremont cottonwood, a few species of willows, seepwillow, tamarisk, water birch, Russian olive, and boxelder.

Wildlife is abundant in riparian zones for a simple reason: All animals need water to survive. Even many desert-dwelling creatures must visit open water sources to drink. Desert bighorn sheep can go for days without drinking, but must eventually find a stream, spring or pothole. Lactating ewes stay near water sources. Sheep, mule deer, mountain lions and other large mammals may have huge territories, but must drink at various intervals. Besides using riparian zones as water sources, predators find prey more abundant here.

Some creatures are adapted to live their whole lives in riparian zones adjacent to water, or in the water itself. Beavers are common along streams in southeastern Utah. They build familiar dams and lodges along small streams, but live in dens in the banks of larger rivers that are too large to dam. Muskrats are also common, and a few river otter live along the Colorado River. Ringtails, raccoons, and skunks are most commonly found along streams.

Many insects are confined to water for all or some stage of their lives. Aquatic insects occupy a variety of microhabitats within streams and ponds. Water striders skim the water surface. Caddis fly larvae, in twig- or sand grain-cases, leave trails in the mud as they slowly move across the stream bottom. Black fly larvae use special attachments, like suction cups, to anchor themselves to rocks in waterfalls, filtering smaller organisms from the flow. Some types of mayfly nymphs hold tight to the bottom of loose cobbles sitting on stream bottoms. Diving beetles and water boatmen are more active swimmers.

Riparian zones are rich in bird life. Most songbirds rely on insects for all or part of their diet, especially during nesting season when their protein needs are highest. Larger water birds, including great blue herons, ducks and Canada geese, feed on aquatic plants or prey on aquatic organisms. Osprey and bald eagles primarily eat fish. Peregrine falcons nest on cliffs, common along river canyons, and eat the songbirds common along the rivers.

If streams were straight chutes with constant downhill drops, flow would have a constant speed and direction. But streams have irregular sides and bottoms, and are steeper in some places than others. So flow varies. Water generally flows faster on the outside of a riverbend than on the inside. Rocks or curves can create backward flow areas behind them called eddies. Rocks mid-stream with water flowing over the top can create holes, where flow becomes a vertical, sometimes-recirculating affair. Rapids are created when a large amount of rock washes or falls into a river, constricting the flow. The constriction creates slow-moving water just upstream of the rapid.

Flow affects the organisms living in the stream, and also affects humans on river trips. Gaining an understanding of flow, called reading the water, is a fascinating and important part of learning to row or paddle a boat.

PRE-TRIP ACTIVITY

Imaginary river trip

NOTE

Before starting, lay out yarn in the shape of two rafts on the classroom floor, in front of a screen. Set up slide projector and slides. Leave river gear out of sight of the students.

PROCEDURE

1) Introduce the topic of water, asking the students how they use water and how other people use water. Prompt them as needed to include a diversity of uses, such as drinking, cooking, washing, cooling off, farming, mining, gardening, growing lawns, and having fun. Tell students that some people like to have fun by going on river trips down the Colorado River. Ask students if they would like to go on an imaginary river trip with you.

2) Grab the river gear, putting on the hat and life jacket. Explain why you need each piece of gear for your trip: the paddle to paddle the boat, the hat to provide shade from the hot sun, water to drink, a bail bucket to get water out of the boat after going through rapids, and a life jacket just in case the boat goes upside down or you get thrown out of the boat. Tell students that they're all going to paddle on this trip, so they have to cooperate and listen carefully. Show them where their "boats" are and show a few at a time how to sit in the first boat. Then have the others sit in the second boat. Have them buckle and tighten their imaginary lifejackets. Show them how to paddle with their imaginary paddles, and have them practice for a few seconds.

3) Start the slides. Follow and embellish the **Imaginary River Trip Script**.

4) When students are back in their chairs, review the lesson that plants and animals, including humans, need water to survive. Discuss uses seen along the river.

5) Preview upcoming field trip, and tell students what items they need to bring on the field trip.

OBJECTIVES

Students will be able to:
- Describe ways that people, plants and animals use water.
- State that many plants and animals live along rivers.

MATERIALS

- Two long pieces of yarn
- River gear including life jacket, hat, paddle, bail bucket, and water bottle
- Imaginary River Trip slides
- **Imaginary River Trip Script**
- Slide projector
- Extension cords

TIME

- 30 minutes

PRE-TRIP

IMAGINARY RIVER TRIP SCRIPT

SLIDE	NARRATIVE
River	Here we go. It's a beautiful sunny day. The river's calm here; no rapids. So we can just float along.
Mallard Duck	Look, what's floating on the water? (duck) Why do you find ducks by water? (food, safety)
Mule Deer	Look over on the shore! Why do you think that deer is here? Do you ever see deer places other than by the river? (Yes, but they are large animals and can walk a long distance to water.)
River	Where do you see most of the plants around here? (by the edge of the river) Yes! Let's paddle over to the side and take a closer look at those plants.
River, Shore	Keep paddling!
Closer Shore	
Beaver	Oh, look! What's that on the shore? Why does the beaver live here?
Tamarisk flowers	Look at the pink flowers. This tamarisk shrub makes a thicket; it needs a lot of water to grow. It has to have its roots down in wet sand or it will die.
Ringtail	Oh, there's a ringtail! They usually live by the water, too. Sometimes they learn that people carry food and they'll even go out on boats pulled up to shore and steal food.
Willow	Here's a willow, another shrub that grows only by water. Lots of animals use willows.
Dragonfly	What's that? Do you know where dragonflies lay their eggs?
Cottonwood	Look up in the cottonwood tree.
Porcupine	There's a porcupine. They eat plants and tree bark and go up into trees for protection. Since most of the trees around here are right next to the river, most of the porcupines are, too.
Great Blue Herons	Look high up into those trees. Do you see those birds? (Discuss how a heron hunts and describe their rookeries.) Let's look closer along the shore.
Tracks, Shadow	There's some tracks.
Toad	A toad! Can you make toad sounds?
Deer Tracks	There's more tracks. Do you know what kind these are? (Deer)
Mountain Lion Tracks	Mountain lion tracks! Do you think she was following the deer? There are many tracks here because all animals need water.
River	What's that roar? I think there's a rapid coming up. Everyone paddle!
Rapid Entry	Everyone hold on with your legs and keep paddling! Here we go!
Rapid	Whoa! Keep paddling! Did we lose anyone?
Calm River	Good job! Now it's time to bail. Heave ho! Oh, I see some trash in the water. We want to keep the water clean for animals who use it and for the other people coming down here. (Ask a student to reach over the side of the boat and grab the trash.) That's enough bailing. Now take a big drink of water. Remember, we need water just as the animals do. And we need lots of water on days when we're outside in the sun and working hard paddling.
Ancient Cliff Dwelling	Look up against the cliffs at the remains of some ancient stone buildings. Those were left by Indian ancestors who lived here a long time ago. Why do you think they chose this place to live? (water)
Eagle	Look high against the cliffs. There's an eagle. Use your arms to soar like eagles. You often see eagles along canyons because they build their nests on cliffs so coyotes or other animals can't get to them.
Coyote	There's a coyote now. They eat lots of different things, including rabbits, mice, grasshoppers, fruits and berries. Sometimes you see them by the river drinking or looking for plants or animals to eat. Let's try just one good coyote howl on the count of three. One, two, three...
Boat on River Shore	Well, we're at the end of our trip. So everybody take off your life jackets, then climb out of your boat and go back to your chairs.

STATION ONE

Who drinks here?

PROCEDURE

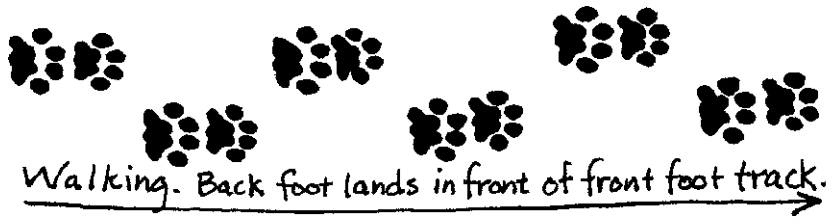
1) Gather students and tell them that you want to show them something exciting. Walk to nearby pre-located clear animal tracks somewhere near the water. Have students crouch around the tracks, asking them to be careful not to step or sit on the tracks! After a moment, tell them that you would like each of them to make one observation about the tracks. Model the meaning of observation by making several descriptive observations about some object such as a hat. Then have each student make one track observation. Make additional observations to cover important unmentioned aspects of the tracks, such as size and number of toes or claws. Describe the approximate size of the animal that would make the size of these tracks, and show some pictures of animals of that size that live in the area. If possible, follow the tracks until they disappear.

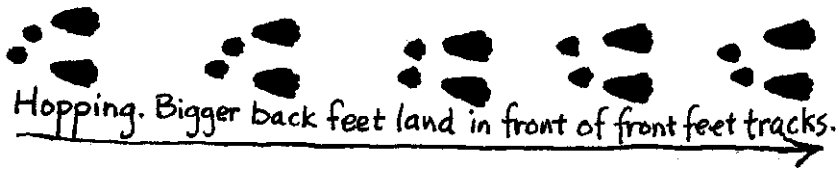
2) If you can find an insect (or catch one beforehand), move it to a fine sandy area and watch it as it makes tracks. Have students again take turns making observations about the tracks. Discuss how the insect moved. Did it hop or walk?

3) Ask students to name some animals other than insects that hop, and some that usually walk or run. Explain that these different movements make different patterns of tracks. In wet sand, draw the pattern of tracks that a walking four-legged animal makes. Imitate such an animal's walk, next to the pattern. Have students try imitating the walk. Draw the tracks of a four-legged hopper in the sand, and demonstrate its movement. Point out how the back feet end up in front of the front feet, and that the back feet are larger than the front ones. Have students try hopping.

4) Go on a walk to look for tracks. Remind students to avoid stepping on tracks, so that others can see them too. Discuss tracks that you see and what animals might have left them. Exact species isn't as important as how the animal moved and the approximate size of the animal.

5) Pass out a clipboard with a quarter sheet of paper and a crayon to each student. Ask students to each choose one track or set of tracks in a defined area, and draw it in as much detail as they can. When they are done, gather students and share drawings. Ask each student to make a guess about the size of his animal and/or about how it moved. Ask students to print their names on the drawings and collect them. Reinforce that it is easiest to find tracks near the water, both because there is good sand and mud for leaving tracks there, and because animals come to water to drink.





OBJECTIVES

Students will be able to:

- Name one thing that can be learned about an animal from looking at its tracks.
- Find and draw an animal track.
- Explain that animal tracks are usually easiest to find near water.

MATERIALS

- Pictures of animals of the area
- Animal track guide (e.g., Stall 1990)
- Clipboards
- Quarter-sheets of blank paper
- Crayons

TIME

- 30 minutes

STATION 1

Objectives

Students will be able to:
- Find insects or other life in a stream.
- Recognize that different types of insects live in different places in the stream.
- Name one animal that might eat insects living in a stream.

Materials

- Two dip nets
- Two observation trays
- Eyedropper
- Pictures of adult forms of a couple of the aquatic insects (e.g., Reid 1967)
- Clipboards
- Pencils and/or crayons
- Poster divided into three sections labeled *In the Water*, *On the Water* and *Under Rocks or Sticks*

Time

- 30 minutes

STATION TWO

Life in, on and under

PROCEDURE

1) Explain to students that they are going to have a chance to look for life in a stream! Check for prior knowledge by asking what they think they might find. Go to the stream, give boundaries, and have students look for life. For the first few minutes have them look and point out insects and other animals without catching anything.

2) Take out the dip nets and ask the students to gather around you. Before you pass out the nets, discuss the organisms sighted so far. Ask if each kind of animal had a preference for swimming on top of the water, in the water, or under rocks or sticks. Then allow students to take turns with the nets and each catch one type of animal. Ask that they try to catch a type of animal not yet caught. Explain that they are catching them to get a better look and then will release them. Demonstrate a gentle method of using a net that will not harm the animals. Ask students to hand you the net when they catch anything, and that you will release their catch into an observation tray. Pass out only one or two nets at once so that you can guide and monitor use. If a student finds an animal too small to catch with a net, you might catch it using an eyedropper.

3) Gather students around the observation trays. Discuss what the insects found might eat, including plant matter and other insects. Ask if students saw any insects eating or chasing other insects. Discuss other animals that might eat the insects, including fish, birds, and muskrats. Discuss butterflies and caterpillars briefly, and explain that many of these insects are young larval insects that, like butterflies, will look completely different when they become adults. Show pictures of adults of one or two of the larvae found.

4) Pass out clipboards, crayons and paper, and have students each draw at least one of the insects in the observation trays. Show students the poster and read the headings to them. Ask if anyone drew a picture of an animal that lives on top of the water. Have these students tape their pictures in the appropriate third of the poster. Repeat for the other two locations. As students post their pictures, be sure their names are on their drawings. Save the drawings for use in the post-trip activity.

5) Emphasize that most of the insects found have to live in water when they are young. Thus, water is important both to them and to the other animals that eat them. Release captured insects.

STATION THREE

Plants thick and thin

NOTE

Pre-select two observation areas to illustrate denser vegetation in the riparian zone, and to avoid negative impact to cryptobiotic soils or plants, especially in the desert zone. If possible, choose a riparian spot where it is possible to dig a shallow hole and see water or feel moisture.

PROCEDURE

1) Ask students: "Where do plants grow closest together around here?" Have them look around and make guesses or predictions. Then explain to students that they have already finished the first two parts of a scientific investigation: the question and the prediction.

2) Define procedure as the steps of doing the investigation. Move to a pre-selected desert area out of the riparian zone. Have students spread out until they can't reach each other, and then freeze. Model a procedure of keeping one foot planted and counting how many plants you can touch. Have students count with you. Model that they don't actually have to touch a plant if it is within reach but spiny; they may count it anyway. Then have each student take a turn touching the plants surrounding him, as all the students count with him. Record the count for each student.

3) Have students follow you to the pre-selected area of thick growth in the riparian zone. Do not mention that this area is closer to the stream; allow students to make this observation later. Again have students spread out and freeze. Repeat the same method of counting, and record numbers.

4) Compare the plant numbers for the two areas and discuss these results. Ask students why more plants grow in the second area. If appropriate, dig a shallow hole in the sand until you hit water or moist sand. If possible without impact, return to the first area and dig a shallow hole to demonstrate the lack of water in this area. Reinforce that the roots of plants near the stream need to be in wet soil to survive. Tell students that the last part of an investigation is a conclusion, and that our conclusion might be that more plants grow where their roots can reach water.

5) Discuss differences between the plants growing in the two count areas, especially that the plants near the stream are taller and greener. Explain that plants growing near the stream would wither up and die where the others are growing, and that the desert plants have special ways of growing so that they can live with less water. Reinforce that even the desert plants need some water, as all life does. Very briefly introduce two to four riparian plants to the students, giving the plant names and ways of recognizing them. Play a tag game in which you periodically call out the name of one of the riparian plants, to be base. Allow students to run as in a regular tag game if this is safe in the area, but if not, demonstrate and play a fast-walk tag game.

OBJECTIVES

Students will be able to:

- Cooperate with and participate in the steps of a scientific investigation.
- Recognize that plants grow closer together near a stream.

MATERIALS

- Clipboard
- Marker or crayon
- Blank sheet of paper

TIME

- 30 minutes

STATION 3

Objectives

Students will be able to:
- Describe and point out an eddy in a stream.
- Formulate a new strategy for racing a stick downstream, based on observations.

Materials

- **Streamflow Clues**

Time

- 30 minutes

STATION FOUR

Exploring the flow

PROCEDURE

1) Choose a short stretch of stream where students can sit and where there aren't any eddies. Have students sit in a line along the streambank, facing the stream. Ask them to look at the water flowing, and to put a hand into the water. Ask which way the stream is flowing. Ask which direction they would walk along the stream if they wanted to walk downhill. Discuss the concept that streams always flow downhill, into larger streams and eventually into the ocean.

2) Ask students to watch as you place a large rock in the water. Have them observe the new direction of flow behind the rock. Place a tiny stick behind the rock and observe its movement. Allow students to take turns putting a hand in the water to feel the movement. Place the rock in different positions, creating different flows behind it, including recirculating holes (vertical flow), eddies (backwards or upstream flow) and simply a slowed flow over the rock. Repeat observation techniques for each rock placement. Explain that places in streams with upstream flow are called eddies. As a group, find a few natural eddies and holes along the stream. Explain that fish spend most of their lives in eddies and holes, and many insects that live in the water also prefer these slow areas. Refer back to the pre-trip Imaginary River Trip, describing eddies on rivers as a good place to pull over to stop. Explain that the water behind some big rocks in rapids can hold boats in them or flip boats, so it's important to learn about water flows if you want to row a boat.

3) Pull out the **Streamflow Clues** and invite students on a hunt for different kinds of flows along the stream. Give boundaries and appropriate water safety rules (perhaps hands in the water but no feet). Read the first clue. Have students search and share results. Continue with other clues, in numerical order. Have students answer the questions at the end of some clues. Monitor and assist so that each student sees an example of the flow described in each clue.

4) Invite students to enter a boat race. Have each student choose a dead stick or leaf to use as a boat, indicating the largest permissible size. Have students stand together on the streambank with selected boats. Indicate where they should toss their boats on a start signal, and a finish line. Allow students to follow their boats along the bank to the finish line. Have them retrieve their boats or choose another, and line up again at the starting line. Ask if anyone's boat stopped in an eddy, or got into an area of slow flow. Race a few more times, discussing where the fastest flows are found, praising new strategies to take advantage of faster flows, and reviewing the concepts of this station.

STREAMFLOW CLUES

1. Find an eddy (a place where water flows upstream).	6. Find a rock that creates an eddy.
2. Find a place where water is moving very slowly.	7. Find something besides a rock that makes an eddy.
3. Find the fastest flowing water that you can.	8. Find a rock that creates a flow that will hold a small stick for at least five seconds.
4. Can you find a place where the water looks still, without any movement?	9. Find a place where water flows around a curve. Is the water moving faster on the inside or the outside of the curve?
5. Find a rock that sticks out of the water. What happens to the flow behind the rock?	10. Find a straight stretch of the stream. Is the water faster in some places than in other places here?

Objectives

Students will be able to:

- State that more plants grow near water than in drier areas.
- State that more animals can be found near water than in drier places.
- Explain that all living things need water to live.

Materials

- Long piece of chart paper with a blue meandering stream colored on it and a few rock drawings taped to it so that they can be lifted on a hinge
- Drawing of thick riparian shrubs and trees
- Drawing of more sparse and shorter desert vegetation
- Insect drawings and track drawings from field trip
- *Three Days on a River in a Red Canoe* (Williams 1981)

Time

- 30 minutes

POST-TRIP ACTIVITY

A stream of life

PROCEDURE

1) Put chart paper up in a visible and reachable location. Tell students that this stream is missing one thing: life! Ask them for help placing life along the river where it belongs. Show them the two pictures of plants, and ask where you should put each picture. Review that different and more abundant plants grow close to the river, where there is more water available for plant roots.

2) Discuss water flow along this stretch of river, and have a few student volunteers point out where the flow might be fast or slow, and where an eddy might be found.

3) Ask where a fish might spend much of its time. Show a few student drawings of insects and other life found on the field trip, asking where each might be found in the stream. Have the artist of each animal tape her drawing in the river or under a rock as appropriate. After discussing and placing several insects individually, distribute a few at a time for the remaining students to place.

4) Follow a similar procedure with the track drawings. Review that tracks of land animals are common near streams because the animals come to water to drink or find other animals to eat. Have students tape track drawings on chart, near the water if they found their tracks near the water and farther from the water if they found them farther away.

5) Review that all animals and plants need water, and that this is the reason for all the life near streams. Find a suitable place to display the mural in the room for at least a few days.

6) If possible, have students sit close together on the floor for a story. (The book's drawings are small.) Read *Three Days on a River in a Red Canoe*. Discuss the book and the life that the family saw along the river.

POST-TRIP

References and Resources

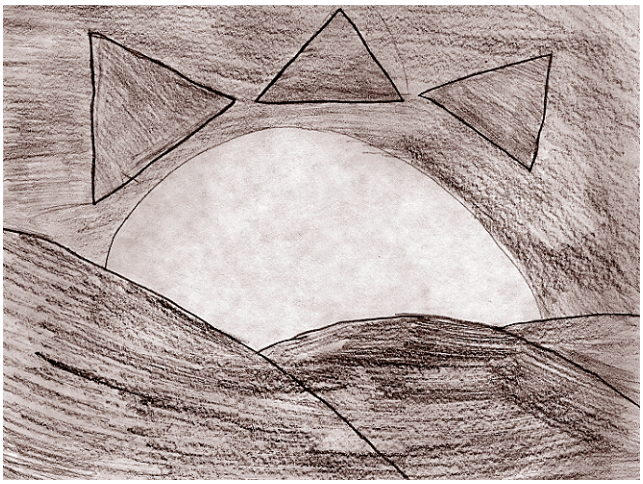
Fagan, Damian. 1998. *Canyon Country Wildflowers: A Field Guide to Common Wildflowers, Shrubs, and Trees.* Helena and Billings, MT: Falcon Publishing.

Reid, George. 1967. *Pond Life*. A Golden Guide. New York, NY: Western Publishing, Golden Press.

Stall, Chris. 1990. *Animal Tracks of the Southwest.* Seattle, WA: The Mountaineers.

Wiliams, Vera B. 1981. *Three Days on a River in a Red Canoe.* New York, NY: Greenwillow Books.

Air & Weather



JESSICA STOUGHTON

Outline

Theme
The various components of weather affect the lives of plants, animals, and people.

Utah State Science Core Curriculum
Topic: Air and Weather
Standard [3010-01]: *Students will describe the characteristics and uses of air.*
Standard [3010-05]: *Students will observe and describe the basic components of weather as related to the activities of plants, animals, and people.*

Suggested Field Trip Locations
A riparian zone with varied trees and shrubs and an adjacent desert area. Because students will be exploring microhabitats and animal shelters, the more varied the area the better. Access to water is needed for Station #1.

Background

Sun, clouds, wind, rain, sleet, hail, snow, and the tilt and rotation of the earth through the year are all components of weather. On this field trip, students explore how weather affects humans, wildlife and plants. Students measure air and water temperatures quantitatively, and wind qualitatively. Back in the classroom, they graph these temperatures and see that water temperature changes more slowly than air temperature.

Most desert animals are *nocturnal*, being most active at night. This can be an adaptation to both predation and hot summer daytime temperatures. Desert animals of southeastern Utah that are mostly nocturnal include kangaroo rats, woodrats (also called packrats), and most other small desert rodents, skunks, ringtails, foxes, bobcats, mountain lions (also called cougars), bats, and owls. Animals that are most active at dawn and dusk are called *crepuscular*. These times of day are cooler than mid-day. The half-dark makes prey animals less visible, yet visibility is good enough to locate food. Some animals are crepuscular mostly because their prey is crepuscular. Primarily crepuscular animals of the region include mule deer, coyotes, porcupines, desert cottontails, black-tailed jackrabbits, and many songbirds. A few desert animals are primarily active during the day, or *diurnal*. These include rock squirrels, antelope squirrels, chipmunks, lizards, snakes, hawks, and eagles. Many animals have a temperature range in which they are active, so alter their active times of day depending on the season. Snakes and lizards go into an inactive state of torpor during the winter, are active during the day during the late spring and early fall, and become crepuscular during the heat of summer. Many insects alter their times of activity. Mosquitoes, for example, may be out at night, at dawn or dusk, or all day but not at night, depending on the temperatures.

Tree rings give insights into past climates. Each ring is a layer of growth from one year. In cold climates, trees have a burst of growth in the spring, during which they lay down a light-colored layer of thin-walled cells called *earlywood*. As summer progresses, a layer of darker, thick-walled cells called *latewood* forms. This couplet forms one year's growth ring. Trees in the tropics that grow year-round often have more than one ring per year, or rings that are hard to distinguish. Ring thickness varies with tree species, age, and stress factors. The most common stress factor, particularly in the arid West, is lack of water. Others include damage to roots, insect infestation, disease, transplanting, and competition from other trees for water, sunlight, or nutrients. Other elements that can be observed in tree rings include lightning strikes, present and past branches, and uneven growth on opposite sides of the tree resulting from growth on a slope or close proximity to another tree, cliff or structure (*Trees are Terrific!* 1985, 17).

PRE-TRIP ACTIVITY

The wonders of weather

PROCEDURE

1) Ask students to describe today's weather, and then all kinds of weather, compiling their list of weather components on the blackboard. Include rain, snow, hail, sleet, clouds, cold, hot, temperature, wind, and sun in the list. Discuss how much weather affects and entertains people.

2) Have a student represent the sun by standing and holding a flashlight. Explain that the sun's rays are hottest where they hit the Earth from straight overhead. Have another student stand with her back to the "sun," and ask the class which side of this student's body would be warmest. Hold up a world globe and have a student point to the side of the globe that would be warmest. Demonstrate how the earth rotates. Point out the poles, which always get low-angle light, and the parts of the globe near sunrise or sunset. Demonstrate the tilt of the earth through a year, and how this creates seasons. Incorporate student volunteers to help with demonstrations.

3) Demonstrate some causes of wind. Release a feather a few inches over a heater or pre-heated hot plate. Explain that the feather rises because hot air is lighter than cooler air. Explain that the sun sometimes heats up air more in one place than another, and the warmer air always tends to rise above cooler air, creating wind. Use a world globe to show students another cause of wind, the rotation of the Earth. Then model and have students follow your example of putting one hand about a foot in front of your mouth. Blow. Ask students if they felt their breath on their hand. Have students follow your modeling of placing one hand six inches in front of your mouth and the other where it was before, and blow. Could students feel the wind on the closer hand? Could they feel it on the farther hand? Explain that hills or mountains can deflect the wind, making it blow in some places more than in others, and in all sorts of directions.

4) Read a story about a rainstorm, *Storm on the Desert* (Lesser 1997). Discuss. Instruct students to mimic your movements, but to try not to make any other sounds. Explain that you will walk in front of the class from one side to the other, and that they should start mimicking only when you are in front of them, and should continue making that movement until you are in front of them again. Practice a movement or two until most of them have the idea. Ask them to listen for the sound of a rainstorm. Then start the storm off by rubbing your hands together. On the next pass in front of the class click your fingers, then clap your hands, and finally stomp your feet and clap your hands. Reverse the order of the movements as the storm recedes. Ask students if they recognized the sounds of a thunderstorm. Explain that students will explore more about weather and its effects on plants and animals on their upcoming field trip. Go over behavioral expectations and the items that students need to bring to school for the field trip.

OBJECTIVES

Students will be able to:
- Describe one cause of wind.
- Name the earth's main source of heat.

MATERIALS

- Flashlight
- Globe
- Hot plate or heater
- Feather
- *Storm on the Desert* (Lesser 1997)

TIME

- 30 minutes

PRE-TRIP

Objectives

Students will be able to:
- Use a thermometer and simple wind vane.
- Name a place likely to be warmer and/or less windy within a relatively small area.

Materials

- Thermometers for measuring air and water temperatures
- Pencils with erasers
- Straight pins
- Yarn cut in 6-inch lengths

Time

- 30 minutes

STATION ONE

Temperature & wind

PROCEDURE

1) Tell students that they will be measuring two important elements of weather at this station: temperature and wind. Define *temperature* as a measurement of how hot or cold something is. Prompt students to find out what temperatures they are familiar with, such as a 100° day, the freezing point, and body temperature. Discuss types of thermometers with which students may be familiar, including those used for measuring whether someone has a fever when they're sick.

2) Walk to the creek. Model and have students use thermometers to measure water temperature. Go to an agreed-upon location for half-hourly air temperature measurements during the week's field trips. Model and have students use thermometers to measure air temperature. Record the time, date, student names, average water temperature, and average air temperature, to be used in the post-trip activity.

3) Tell students that air temperature often varies from place to place, even in a small area. Discuss possible nearby microclimates, such as under leaf litter or in a bark crevice, down a burrow, in shady places and in sun. Ask students to predict which place will be coolest and which will be warmest. Measure and record temperatures in several different places, using student suggestions as much as possible. Discuss the results, and where different animals might go to get warmer or to cool off.

4) Ask students where they would go if they were out here and it was very windy and cold. What about if it were very hot and they wanted to be in the breeze? What about if they were insects that could be easily blown away in a breeze? Explain that they will walk to different areas to check out the wind, but first they are going to make wind vanes (Storer Camps 1988, 91). Demonstrate. Poke a straight pin halfway through a length of yarn, near one end of the yarn. Then poke the pin straight down into the top of the pencil eraser. Walk to different locations and decide as a group whether the wind is blowing very hard, medium hard, barely at all, or not at all. Have all students hold their pencil wind vanes straight up and see which direction the wind is blowing. Explain whether this is a typical or unusual wind direction, and figure out with students which shelters would be the best ones considering the typical wind direction (east-facing shelters, generally). If it's a still day, have students imagine each spot on a windy day.

5) Review and discuss the results of the temperature and wind measurements, and the idea of microclimates. Dismantle wind vanes.

STATION TWO

Where do animals go when it rains?

PROCEDURE

1) Ask if students have ever been outside in a rainstorm. Ask if they can remember seeing any animals. Explain that many kinds of animals seek shelter during storms. Show students the poster scene. Discuss the poster and the rainstorm in the poster. Give an Animal Picture Card to each student. Ask a student to hold up his picture and say his animal's name. Have students try to guess where the animal would go in the poster scene during the rain. Read the **Animal Quote** corresponding to the picture for a check on student answers or to give students a clue. Have student holding the card then tape his picture to the poster in an appropriate place. Repeat procedure for each student's animal.

2) Ask students to quietly look around for a place that would be good for their animal to go during a rainstorm. Give boundaries and safety information as needed. Explain that when you make a rain sound, they are to go to, or near, their "rain place." Give signal, and monitor student dispersal. Call students back and discuss their choices of places. Take Animal Picture Cards off the poster, shuffle and re-distribute them. Play several rounds, giving each student a chance to be several different animals.

3) Discuss the animals that didn't seek shelter during the storm, as well as the ones that did. Go for a walk with the students, looking for good shelters from the rain for different kinds of animals. Go near the creek for part of the walk, and look closely. Introduce other animal shelters depending on what you encounter. Discuss buildings or other structures people build that animals sometimes use as shelters, such as skunks living under houses, bird nests under the eaves of houses, bats in attics, and spiders and cockroaches in houses.

Objectives

Students will be able to:
- Explain where at least two animals go during rainstorms.
- Explain why many animals seek shelter from storms.

Materials

- Poster scene (Draw a riparian zone with shrubs and trees, sandwiched between a stream on one side and desert on the other side, in the rain. Include a ground squirrel burrow and a couple of puddles in the desert area.)
- **Animal Quotes**
- Animal Picture Cards (one picture of each animal in Animal Quotes, each mounted on a 3"x 5" index card)
- Masking tape

Time

- 30 minutes

STATION 2

ANIMAL QUOTES

Mallard Duck
My feathers are waterproof and I like to float during rainstorms, or anytime!

Sparrow
Flying is for the birds, but not when it's raining hard. I'll sit on a tree branch and wait it out.

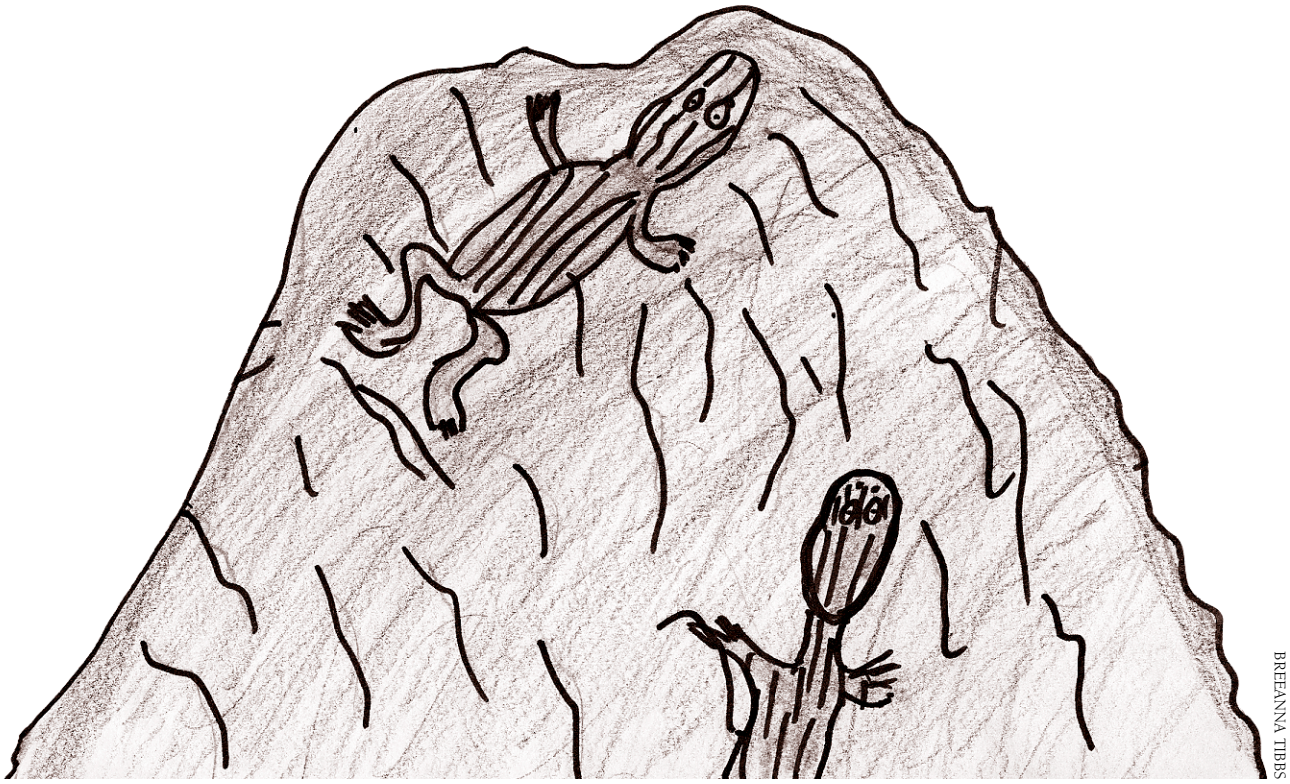
Antelope Ground Squirrel
A few drips don't bother me, but a rainstorm - in my burrow I'd rather be.

Mosquito
A breeze can blow me away and a raindrop can ruin my wings. I'll be in a crack in the tree bark or under some plant umbrellas when the storm comes in.

Spadefoot Toad
I live most of my life buried underground. But when I hear thunder, I dig my way out, to find my mate in a rainstorm puddle!

Lizard
I don't mind rain on a really hot day. But rain usually cools things off, so I seek shelter under a rock ledge, a shrub, or anywhere I can stay warm and dry.

Red-tailed Hawk
On sunny days, rising warm air makes it easy for me to soar. On stormy days, I don't fly much. You might find me in a tree, or on a rocky cliff ledge.



BREEANNA TIBBS

STATION THREE

Tree rings

PROCEDURE

1) Gather students and tell them that you want to introduce them to a friend. Walk over to a tree, and introduce them by telling them what kind of tree it is. Tell them about the tree: It makes its own food as long as it has sunlight, water, soil, and air. It needs rain so that there will be water for the roots to collect. Have students feel the tree's bark. Explain that water comes up a tree's trunk in a layer just under the bark and goes to the leaves. The leaves mix up the water, sunlight and air and make food for the plant. That food spreads out through the plant and helps it grow.

2) Show students a slab of a tree trunk. Show them a tree ring and explain how rings form. Pose the question, *Will a tree grow more in a year when it rains a lot, or in a year when it doesn't rain very much?* Have students point to a growth ring from a year when they think it rained a lot, and point to a growth ring from a year with little rain. Explain that other factors might keep a tree from growing very much, including too much shade, a long cold winter, or a heavy insect infestation. Look around and see if there are any trees nearby that may have slowed-down growth from any of these factors. Point out other features of the tree rings, such as the location of a branch, fire scar, or uneven growth on two sides of the trunk. Count the rings aloud with the group to find out how old the tree is.

3) Pass out other slabs. Have students count rings. Ask them to examine their slabs for different features discussed. Share discoveries. Again ask students to point to growth rings that may have formed during a year with lots of rain and during a year with little rain.

4) For safety's sake, model the next activity before having the students start. Blindfold a volunteer student. Ask other students to be very quiet. Lead blindfolded student to a tree in an indirect route, discussing and modeling the importance of going slowly and warning your partner if he needs to step up or down. Place the blindfolded student's hands on the tree. Ask him to feel the tree's size, texture, whether it's standing up straight, and whether he can feel any branches. Suggest feeling the texture with a cheek. Then lead the student, again indirectly, back to the student group. Remove the blindfold and ask if he can locate his tree. Pair students and help them blindfold one in each pair. Remind them to walk slowly and talk to their partner. Wait until all students have returned to the starting point before removing blindfolds and having them find their trees. Blindfold the other half of the students and repeat (Cornell 1979, 27).

5) Review the concept that trees need water, and that they grow more in wet years than in dry years.

OBJECTIVES

Students will be able to:
- State that trees need water to grow.
- Correlate wider tree rings with wetter growing years.

MATERIALS

- A few slabs of tree trunks or branches with visible trees rings (the more variety the better)
- Blindfolds

TIME

- 30 minutes

STATION 3

Objectives

Students will be able to:
- Describe at least one way that lizards cope with heat.
- Describe at least one way that antelope squirrels cope with heat.

Materials

- Pictures of several nocturnal and crepuscular desert animals
- Pictures of different types of lizards that live in the area
- **Lizard Weather**
- Pictures of an antelope squirrel
- **The Rounds of an Antelope Squirrel**

Time

- 30 minutes

STATION FOUR

Coping with heat

PROCEDURE

1) Ask students to think for a minute about sometime when they were really hot. Describe a situation in which you were really hot, then go around the circle and let each student briefly describe a situation. Compile a list of ways that students use to cool off, including going swimming, staying in the shade, using a fan or air conditioner, drinking something cool, and playing outdoors only during the morning and evening when its cooler.

2) Tell students that animals have to cope with heat, too. Explain that many animals in the desert are only active at night and are called *nocturnal* animals. Discuss examples and show pictures. Explain that other animals are mostly active in the mornings and evenings. They are called *crepuscular* animals. Discuss examples and show pictures.

3) Show pictures of different types of lizards that live in the area. Describe two mechanisms that lizards use when it is very hot: staying in the shade, and being most active in mornings and evenings. Explain that lizards like it quite hot, though, so you can often see them out even on hot days. Sometimes they stay in the sun for awhile, or just go into half-shade. Walk around and look for places of deep shade and of half-shade. Instruct students to listen as you read a story, and to respond to what you read by moving to an appropriate place. Give examples and designate relatively close boundaries, so that they can hear you read. Read **Lizard Weather**, pausing to give students time to move to sun, full shade, or half-shade, as indicated in the story.

4) Show pictures of the antelope squirrel, and tell students its name. Explain that, like lizards, it is active during the day, and has some unusual ways of cooling off. Ask them to listen to the next story and act out the part of the antelope squirrel as you read. Give relatively tight boundaries so that they can hear you read. Read **The Rounds of an Antelope Squirrel**.

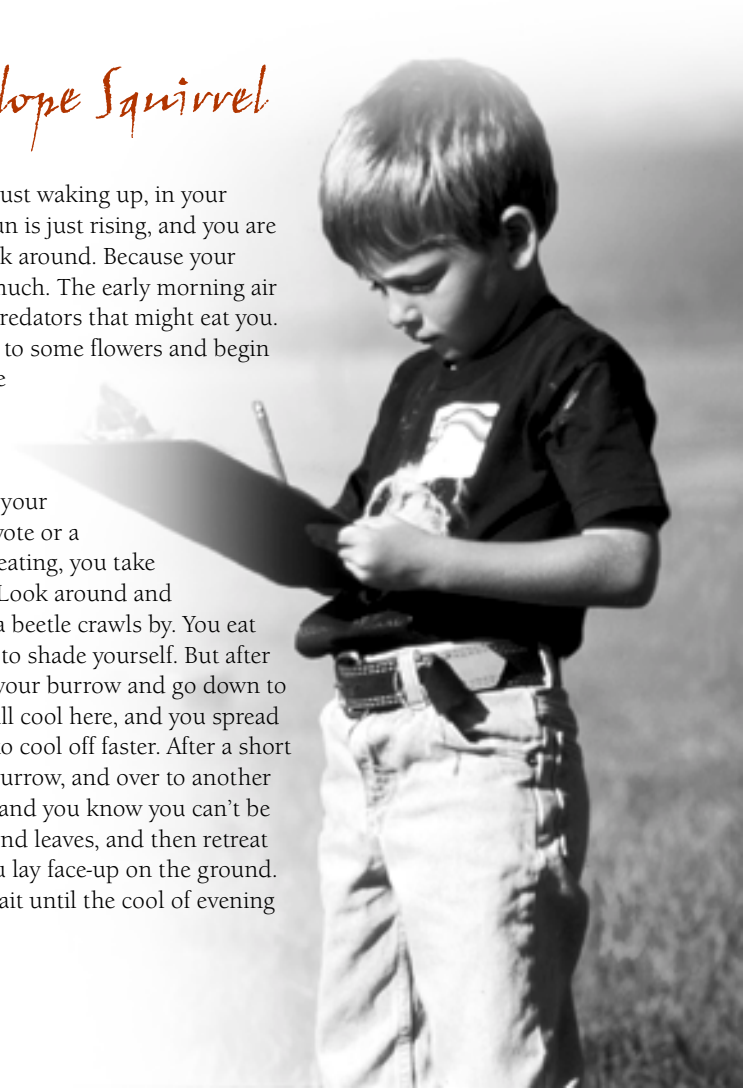
5) Review by asking students to keep lizards in mind as you read through the student-generated list of their heat-coping mechanisms. Have them raise their hands whenever they hear a mechanism that lizards use, too. Then read through the list again and have them raise hands when they hear a mechanism that antelope squirrels use. Ask what mechanisms the animals used that weren't on the list.

Lizard Weather

Pretend that you are a lizard, tucked under a small rock ledge. The sun is just rising in the morning. Your body doesn't move very fast because you are cold, but you move slowly out from the ledge, just far enough to bask in the sun. You turn your body so that your broad back faces the sun. After a few minutes you feel warmer. You are hungry, so you watch for movement. You see a fly! Run three steps, then try to zap the fly with your tongue. Oops, missed. You walk and look around under some nearby shrubs. There's another fly. Zap - got this one. Mmmm, breakfast. Time to sit in the sun for a minute and digest that fly. Oh, but now you're getting a little warm. Time to move to some half-shade. You nap for a few minutes. Here comes another lizard, in your territory! Time to look big and try to scare him away. Move out from the shade into full view, and do some pushups. One, two, three, four, pause, one, two, three, four. Finally, the other lizard is leaving. He looked like a young one. But now you are hot from the sun and all those pushups. Move into full, dark shade.

The Rounds of an Antelope Squirrel

Pretend that you are an antelope squirrel. You are just waking up, in your burrow one foot or more below the ground. The sun is just rising, and you are hungry. Climb up to your burrow opening and look around. Because your burrow is so deep, it doesn't change temperature much. The early morning air outside feels cooler. You look around for signs of predators that might eat you. The coast is clear, so out you go. You scamper over to some flowers and begin to eat them. Some of the flowers are older and have already made seeds. What luck! Flowers and seeds are your two favorite foods. Eat more flowers, then collect some seeds in your cheeks and run back into your burrow. You eat the seeds slowly in your burrow, where you don't have to worry about a coyote or a hawk sneaking up on you. When you are finished eating, you take a short rest. Then out of the burrow you go again. Look around and choose another plant to eat. While you are eating, a beetle crawls by. You eat it, too. You are out in the sun so you raise your tail to shade yourself. But after awhile you begin to feel very hot. You run back to your burrow and go down to the deepest part, where you slept last night. It is still cool here, and you spread out and lay flat with your back on the the ground to cool off faster. After a short rest, you are ready to go out again. Up, out of the burrow, and over to another flower. You chew quickly, as the sun is hotter now and you know you can't be out for long. You finish eating a few more flowers and leaves, and then retreat again to the deepest part of your burrow. Again you lay face-up on the ground. This time you decide to rest for a few hours, and wait until the cool of evening to go out for more food.



Objectives

Students will be able to:
- Participate in constructing a graph with data that they have collected.
- State that water temperature doesn't change as quickly as air temperature.

Materials

- Temperature information recorded during the Temperature & Wind Station of the field trip
- Two large sheets of chart paper
- Tens markers (e.g., large red construction paper squares)
- Ones markers (e.g., small red construction paper squares)

Time

- 30 minutes

POST-TRIP

POST-TRIP ACITIVITY

Great graphing!

PROCEDURE

1) Review the major components of weather and the field trip stations.

2) Take out a clipboard and tell students you have the water temperature and first air temperature that each field trip group measured. Have students predict if it got warmer or cooler during the field trip. Instruct students in creating a graph to compare the temperatures. On chart paper, draw graph axes. Label y-axis, *Air Temperature*. Label the x-axis, *Time*. Title the graph, for example, *Air Temperature on Ms. Smith's Class Field Trip to Courthouse Wash, Nov. 2, 2000*. Draw four columns within the graph for the four field trip groups. Read the time of the first air temperature measurement of that day and print it below the first column. Read the names of the students in the group that made this measurement, and have them gather in the front of the room. Tell them the temperature that they measured. Ask the class to hold up fingers for how many tens are in that temperature. Pass out the appropriate number of tens markers to members of the group. Guide students in taking turns placing the ten markers from the bottom of the column up, on the graph. Ask class how many ones they need to add. Hand out ones markers to remaining students and have them place these above the tens in the column. Ask first group to return to their seats, and call the names of students in the second measurement group. Repeat the graphing procedure for each of the four groups. Discuss the changes in air temperature seen through the day of the field trip.

3) If another class has already graphed their air temperatures, compare graphs of two different days. If not, arrange to compare at a later time.

4) Take out another sheet of chart paper. Repeat graphing process with water temperatures gathered on the field trip day. Compare air temperature changes to water temperature changes. Reinforce that water temperature changes much more slowly than air temperature.

5) Post graphs from different classes in hallway for further comparison and reinforcement.

References and Resources

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Plants

KAYLA EDDY

Outline

Theme
Plants are an important part of the natural world and of our daily lives.

Utah State Science Core Curriculum
Topic: Plants
Standard [3010-04]: *Students will observe and categorize plants and plant parts according to similarities and differences.*

Suggested Field Trip Locations
Any location with at least a few colors of flowers blooming, a variety of leaf shapes, and a stream or other natural water source.

Objectives

Students will be able to:
- Name at least three parts of a plant.
- List two ways that plants have helped them that day.

Materials

- Paper and crayons
- Felt board and felt plant parts
- **How Plants Got Their Parts**
- "Roots, Stems, Leaves" (The Banana Slug String Band 1989)
- Tape player
- (optional) Guitar and copy of music

Time

- 30 minutes

PRE-TRIP

PRE-TRIP ACTIVITY

"Roots, stems, leaves"

PROCEDURE

1) Introduce *plants* as the interesting and fun topic of the upcoming field trip. Explain that plants are an important part of the natural world and of our daily lives. Call on a few student volunteers to say one thing that they know about plants or ways that they use plants everyday. Explain that plants are kind of like people in that they have different parts of their bodies that help them do different things. Demonstrate this idea by having students point to their noses. Ask what their noses do for them. Then have them point to their eyes and ask what their eyes do for them.

2) Tell students that you are sure they know something about plant parts already, and that they can show what they know by drawing a plant on a piece of paper. Ask them to draw any plant that they want, but to be sure and include as many plant parts as they can remember. Pass out paper and crayons, and allow about five minutes for them to draw.

3) Ask students to bring their drawings and sit in a circle. Once settled, instruct students, on the count of three, to hold up their drawings for all to see. Tell students that you have a story about plants for them. Ask them to listen carefully and decide which parts of the story are imaginary and which parts are true. Bring out the felt story board. Read **How Plants Got Their Parts**, moving around the felt pieces to illustrate. After the story, make sure that students understand that though flowers can't really fly or think, the functions of the various plant parts are depicted correctly in the story. Review the names and functions of the plant parts.

4) Build anticipation for the plants parts song by explaining that some people are so excited about plants that they have written songs about them. Play tape of "Roots, Stems, Leaves." (Optional: Play guitar and/or sing along, or teach movements to go along with the chorus.) Ask students to listen very carefully for any foods in the song, and play again.

5) Tell students that they will explore more about plants and their parts on their upcoming field trip. Go over behavioral expectations and the items that students need to bring to school for the field trip.

How Plants Got Their Parts

Once there was a flower floating by itself in the sky. It was a beautiful sweet-smelling purple flower. (Place felt flower on blue background). The flower became thirsty, but it didn't have a mouth or any way to get water. The flower knew that water was in the soil, but couldn't figure out how to get that water. The flower saw some roots in the ground that were sucking up water. (Place felt roots on soil background and make slurping sound.) The flower was thinking about how to get some water when suddenly a stem appeared above the roots. (Place the felt stem.) The flower hopped to the top of the stem. (Move the felt flower accordingly.) The stem acted like an elevator and brought water up to the flower.

After it drank, the flower realized it was hungry. It didn't have any hands to grab food, or a mouth to eat with, or legs to take it to food. As it was thinking about this, it noticed leaves sprouting from its stems. (Add felt leaves.) These leaves were able to do something that was very unique. They could take sunlight, air, and water and put them together to make a simple sugar for the plant to eat. (Ask students if they can make food with just sunlight, air and water. Explain that people and other animals can't do this, but all plants do this.) The stem began moving food up and down throughout the plant, along with the water it was moving.

The plant was happy that it had food and water, but the plant was getting kind of old and it knew that it wouldn't be around for too much longer. It wanted to make sure there would be more plants like it in the future. As it was thinking about this, the flower slowly turned into a fruit. (Replace the felt flower with a felt fruit.) In the fruit were seeds. (Place felt seed on fruit.) The fruit eventually fell down to the ground and broke open. Some of the seeds were buried. (Move felt fruit and seed accordingly.) Later, one of the seeds sprouted and became a new plant, and the cycle started all over again. (Place new felt plant sprout on felt board.)

Objectives

Students will be able to:
- Name at least three plant parts.
- Notice differences between plants.

Materials

- Poster-sized plant drawing with basic plant parts labeled
- Name tags with yarn for hanging around necks, labeled *roots, stem, leaf, leaf, flower*
- Cardboard sun
- Cardboard bee
- Laminated drawings of individual plant parts

Time

- 30 minutes

STATION ONE

Plant power

PROCEDURE

1) Use the plant parts poster to review the basic parts of a plant and their functions.

2) Tell students that they are about to become parts of a big plant. Have one student sit on the ground with her legs out in front of her. She is the *roots*; give her the *roots* name tag to wear around her neck. Explain that roots hold the plant in the ground and give the plant water. Have this student make a sucking noise. Choose a second student to be the *stem*. Have him stand directly behind the roots and move his hands up and down to represent the water that moves up and down the stem. Choose one or two students to be *leaves*, and have them stand next to the stem. Remind students that leaves make food for the plant. Have leaf-students hold out their hands toward the *sun*, shake their hands, and say, "Mmm, food." Ask a student to be a *flower*, and stand directly behind the stem. Tell students that flowers attract insects, which move pollen, and thus help the flowers create new seeds. Have another student or the flower-student hold up the cardboard *bee* and make a buzzing noise. Collect the name tags.

Optional: Have students act out the development of a flower. First the flower is pollinated, then it turns into a fruit with seeds inside, the seeds drop and are buried, and the seeds sprout to become new plants.

3) Hand out a laminated plant part to each student. Have students put the plant together on the ground. Review the parts and their functions.

4) Go on a short walk, looking at plants and their flowers. Ask students to smell, touch, and look at plants, but not to pick them. Lead the students to interesting plants, and/or follow student interests. Ask students to use their eyes to see different colors, shapes and sizes of plants, their noses to smell blooming plants, and touch to feel different parts of plants.

5) Have a Plant Parts Relay Race. Put the laminated pieces of plants about 25 feet away. Divide students into two teams, in two relay lines. Tell students that the goal, when they are runners, is to listen to the plant part name called out, then run, pick up the correct plant part, and run back to their team. Other players may call encouragement or tell the runner to go back if he has the wrong part. Play, checking for correct plant parts. Play enough rounds for every student to run at least once. Review functions of different plant parts between rounds.

STATION TWO

The shapes and sizes of leaves

PROCEDURE

1) Have students sit in a circle around the laminated tree. Discuss the function of leaves. Tell students that in a moment you will be passing around some leaves. Ask students to look carefully at each leaf and see what makes it special and different from the other leaves, and to think of some words that describe the leaves. Prompt students to come up with examples of descriptive words before you start passing the leaves. One way to do this is to guide them in thinking of words to describe some object such as a hat. Begin passing out the leaves you have collected, asking students to look at each leaf and then pass it on.

2) After the students have seen all the leaves, ask them for the descriptive words they thought of when they were looking at the leaves. Write each word on a paper leaf and tape the paper leaves to the tree. Ask students how they can tell that some of the leaves came from different kinds of trees or plants. With the students, sort the leaves by species, discussing how they can recognize each category (species).

3) Invite students on a walk to gather leaves. Ask each student to collect a few leaves that have different characteristics. Give boundaries, and guide them as needed.

4) Ask students to return and put their leaves in front of them so that everyone can see all of the leaves. Guide them in creating new categories for the leaves they have collected. Make it clear that this time the leaves don't have to be exactly the same or from the same kind of plant to be in the same category. You may need to name the categories, such as broad, narrow, and hand-like or lobed, or rough, smooth, and pointy. If you have time, re-mix the leaves and re-sort using new categories.

5) Pass out paper and clipboards, and have each student choose a crayon or two. Have each student choose a favorite leaf, and draw it. Ask them to look very closely and include as much detail as possible. Optionally, have each student place paper on top of a leaf and do a leaf rubbing with a crayon.

OBJECTIVES

Students will be able to:
- Separate leaves into categories based on observable differences.
- Explain one function of leaves.

MATERIALS

- Cardboard laminated tree
- Leaves
- Paper leaves
- Tape
- Crayons
- Quarter sheets of paper
- Clipboards

TIME

- 30 minutes

STATION 2

Objectives

Students will be able to:
- Describe several ways plants are used in daily life.
- Name four plants that provide food.

Materials

- Survival bag filled with scrap wood pieces or sticks and plant foods (seeds, fruit, onion, potato, popcorn, peanuts, etc.)
- A poster labeled *SHELTER*
- A poster labeled *FOOD* at top, with the rest of the poster divided into seven sections labeled *roots, stems, leaves, buds, flowers, seeds,* and *fruits*

Time

- 30 minutes

STATION THREE

Plants in our lives

PROCEDURE

1) Choose a place to sit with students within view of a creek or other natural water source. Ask each student to name a favorite food. After each, discuss whether that food comes from plants, and which plants. After all students have had a turn, discuss other uses of plants in everyday life, including clothing (cotton), tools (pencils, paper), shelter (wood for houses and schools), and medicine. Emphasize that plants have always been important to humans, and that we must have them to survive. Ask students to name some examples of plants that they use in their daily lives.

2) Ask the students to imagine that we are stranded here. Tell them that we will need food, water and shelter when we become hungry, thirsty and cold. Ask what we could use as shelter and for food, and where we could find water. Assist students in discovering the water, and walk with them to the creek.

3) Explain that now that we have water, we just need food and shelter. Tell students that they are in luck because you have a survival bag. Pull out the bag, and lay the food and shelter posters on the ground. Hand each student an item from the bag. Have students name their items and describe how they could be used. Have students choose the appropriate poster for each item, and lay the items on the posters. Reinforce that all of these survival items come from plants.

4) Put the shelter poster and shelter items away; put the food items back in the bag. Read the food poster together. Explain that students should try to figure out which plant part each food item is. First review the different plant parts (roots, stems, leaves, buds, flowers, seeds, and fruits). Then reach inside the bag and pull out an item. Have students take turns deciding what part of the plant it comes from, and placing it on the correct category on the food poster.

5) If there is time, review. Put food items back in the bag, and place the food poster 25 feet away. Have students form a line. Pull a food item out of the bag and hand it to a student. Instruct the student to run to the food poster, and place the food on the correct category. Correct as needed, then hand another food item to the next student in line.

STATION 3

STATION FOUR

A closer look

PROCEDURE

1) Ask students if they want to hear a story about something amazing that happened to you (Acclimatization Experiences Institute 1980, *Rainbow Chips*). Embellish a story of a dark rainy day, with a beautiful rainbow appearing against a dark sky just as the rain stops. Tell them that suddenly, without warning, this rainbow collapsed right before your very eyes, and left fragments of the rainbow all around you. Tell them that you collected the fragments and have them with you. Hopefully, you'll get a few questioning looks at this point. If you wish, admit that you may have been dreaming, but it occurred to you that pieces of the rainbow are found everywhere. Invite students on an exploration to find pieces of a rainbow.

2) Pull out the special rainbow piece pouch. Pair students, and distribute two or three color chips to each pair. Instruct them to find something in nature that matches the color of each chip. Distinguish between natural things such as plants, rocks, leaves, and insects, and human-made things in the area. Ask them to observe, but not pick any plants. Instruct students to show their partners when they find a match. When most students are done, have each pair share their favorite color match.

3) Explain that natural things have many different shapes as well as colors (Sisson 1982, 33). Have students name the shapes on the **Shapes in Nature** sheet. Explain that they will be going on a hunt to find things in nature that match these shapes. Explain that some of the items will not be perfectly shaped. Show an example, such as a leaf that is heart-shaped, or a piece of bark that is rectangular. Tell students that they should draw a found item next to its shape on the sheet. Ask them to include details of what they see, such as leaf veins or bumps on a rock. Have them work in pairs again, and ask them to take turns drawing. Hand out a sheet, clipboard and pencil to each pair, and help them get started. When almost out of time, gather students back together and ask them to share one shape they found.

EVALUATION

Have students match crayons to items in nature on a short hike. At the end of the hike, ask students to draw a rainbow with the crayons they matched.

OBJECTIVES

Students will be able to:
- Find several colors and shapes in plants or other natural objects.
- Distinguish between natural objects and objects made by humans.

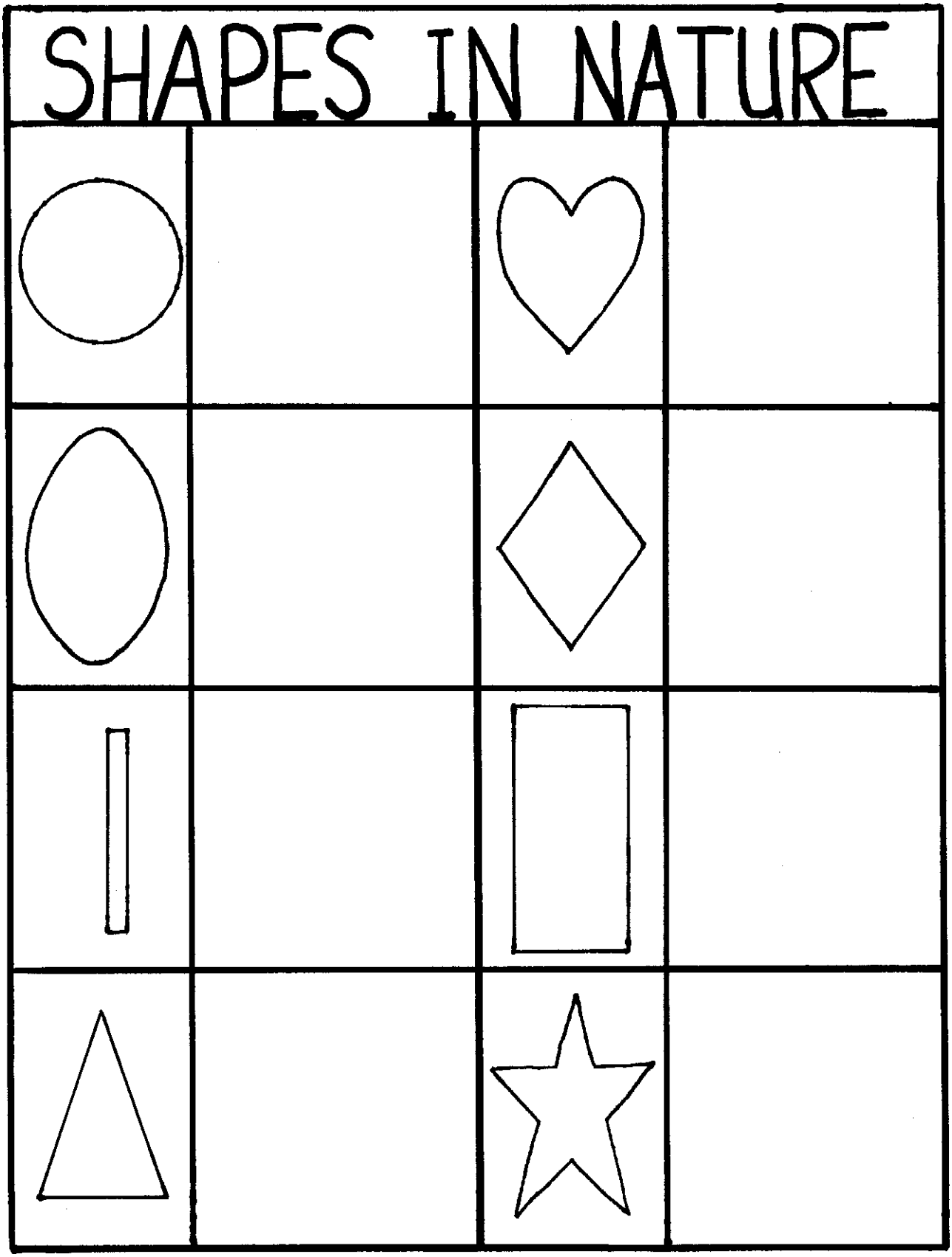
MATERIALS

- Paint chips from a hardware store, or other small colorful pieces of paper, in a small attractive pouch
- Copies of **Shapes in Nature**
- A few rocks or leaves illustrating different shapes
- Pencils
- Clipboards

TIME

- 30 minutes

STATION 4


SHAPES IN NATURE

POST-TRIP ACTIVITY

Flower finale

PROCEDURE

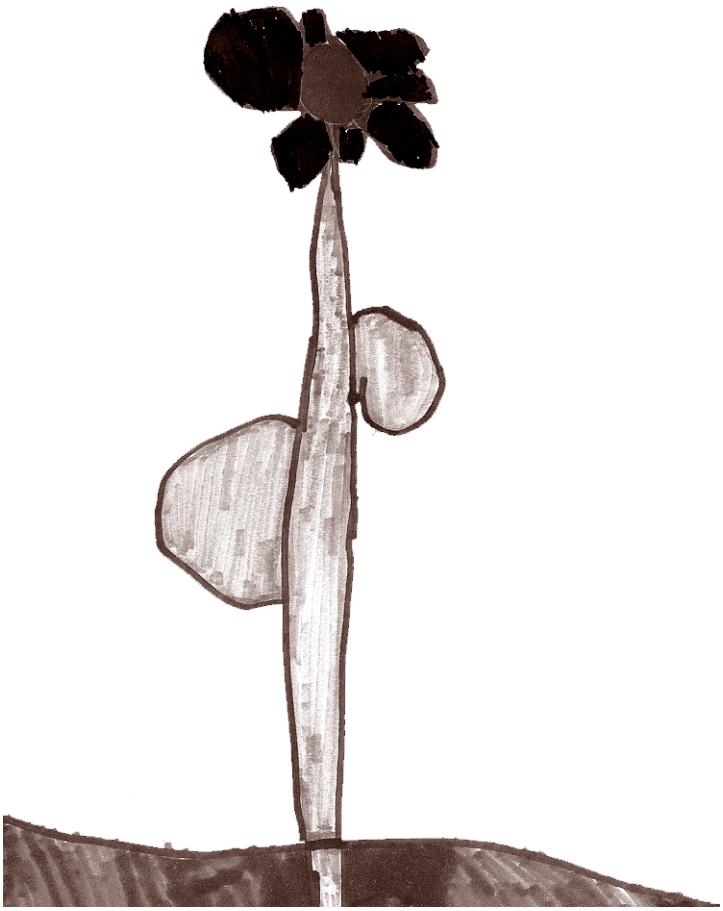
1) Review the field trip, emphasizing plant parts and the roles of plants in our everyday lives. As you review, draw a generic plant with parts labeled on the board.

2) Show pictures or illustrations of flowers and flowering plants found in the desert. Have each student choose one of the flowering plants, or one from memory, to draw free-hand. Instruct students to include all the essential parts of their plants, and to label the parts. Pass out drawing materials and have them begin.

3) Have students color their flowering plants if there is time. Collect and/or share the drawings.

EVALUATION

Have students orally share their flower drawings. Ask each to give their flower's name, and explain what color it is and where it is found.



REXANNA GARCIA

OBJECTIVES

Students will be able to:
- Draw a flowering plant and label its basic parts.

MATERIALS

- Pictures of high desert wildflowers
- Paper
- Pencils
- Crayons

TIME

- 20 minutes

POST-TRIP

References and Resources

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